INSTRUCTION MANUAL

H45

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NJE CORPORATION

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INSTRUCTION MANUAL

FOR

H-LINE

MODEL H-45

SERIAL

HIGH VOLTAGE POWER SUPPLY

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UNPACKING INSTRUCTIONS

The complete power supply shipment consists of a small carton containing the rectifier tubes, accessory parts and instruction literature, and a wooden crate containing the chassis and cabinet. (Supplies with output voltages of 50 KV or higher will have an additional wooden crate, since the high voltage circuitry in these supplies is mounted separately in a steel tank to permit immersion in oil.)

Open the small carton first. Using a short, sharp knife, carefully cut the sealing tape along the center seam and the short edges of the carton top. Remove the spare instruction manual and the packing slip (in envelope) from the carton. Then remove the small parts and rectifier tubes, checking each item against the shipping list.

Open the crate (or crates) by withdrawing the nails with a nail puller or similar tool. Do not use a pinch bar or hammer, and do not pry against the equipment itself when detaching the crate sides.

As soon as the equipment is unpacked, a thorough visual inspection should be made. When the unit leaves the factory it is thoroughly checked, both electrically and mechanically, and is warranted to be in perfect operating condition. However, we cannot guarantee that no damage will be incurred during shipment. Any evidence of mishandling, such as broken, deformed or missing parts, should be brought to the attention of the shipping agency immediately, and a claim should be entered. Open the top and rear cabinet doors and inspect all components and wiring, both on the chassis and on the front panel. If the high voltage components are mounted in a separate steel tank, they can be inspected as follows:

1. Using an open-end or box wrench, remove the bolts around the perimeter of the tank cover.

2. Lift the cover and its attached frame from the tank, using a hoist if available, then rotate the assembly slightly and lower it carefully until it rests upon the top flange of the tank. If a hoist cannot be obtained, an alternate procedure is to slip screwdrivers or bars through the eye-bolts in the cover and lift the assembly far enough to permit gripping the edge of the cover. Three men will be required for this operation.

3. Inspect the components and tank carefully, then replace the assembly in the tank. Do not install the cover bolts, since it will be necessary to open the tank again later when installing the rectifier tubes. The tank should remain covered in the interim, to prevent foreign matter from entering the unit. Contamination of the transformer oil to be used in the tank can impair its insulating properties.

The packaging material should be saved until the supply has been performance-tested, since the equipment should be returned in its original containers if repairs are necessary.

We strongly urge that you take time to read the entire instruction manual, before proceeding further with the assembly and installation of the equipment.

SECTION I

SPECIFICATIONS AND GENERAL DESCRIPTION

MODEL H-45

INPUT:	117 volts ±10%, 60 cycles/sec, single phase at approximately 20 amperes, 75% power factor, at full load.
OUTPUT:	Continuously variable by front panel control from 0 to 20K volts dc at 0 to 50 milliamperes.
RIPPLE:	3.5% RMS at full voltage and load. Ripple voltage is directly proportional to load current, and independent of output voltage.
REGULATION:	Line, none provided. Output voltage varies directly with line voltage. Load, approximately 30%, no load to full load, at maximum output voltage. Regulation is fixed in magnitude, but increases in percentage, as output voltage is lowered.
INTERNAL RESISTANCE:	0.1 megohms maximum.
METERS:	1. Kilovoltmeter, 0 - 5/10/20 kilovolts dc. 2. Milliammeter, 0 - 2/8/20 Milliamperes dc. Both meters with ±2% initial calibration, 4-1/2" rectangular case
HOUSING:	1. Control Section: Deluxe relay rack cabinet for standard 19" wide panels. Dimensions: 22" wide x 18" deep x 21" high Weight: 100 lbs. Finish: Dark gray hammertone cabinet, light gray hammertone panel. 2. High Voltage Section: Dimensions: 22" wide x 18" deep x 28" high Weight: approximately 200 lbs. Finish: dark gray hammertone Output Cable: 10 ft. of RG8/U Interconnecting Cable: 3 ft. of multiconductor cable
POLARITY:	Reversible; output may be set for either positive or negative voltage with respect to ground.

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Controls:	Function	Component
	Line Power (on-off)	Circuit Breaker (Double pole)
	High Voltage Start	Push-button
	High Voltage Stop	Push-button
	High Voltage Control	Powerstat
	[illegible]	
	overload or overvoltage	Push-button
	Overload Trip Adjust	Potentiometer
	Meter polarity selector (plus - minus)	Rotary selector switch
	Meter range selectors (2)	Rotary selector switch
Pilot Lights:	HV Status Indicators	(Incandescent)
	HV Ready	Green
	HV Start	Red
	Overload	Blue
	Overvoltage	White
	Control Status Indicators	(Neon)
	Control fuse open	
	Primary fuse open	
	Safety interlock open	
	Set to "0" interlock open	

Duty: Continuous. Adequate ventilation and correct placement of hot-spot and high-voltage components, conservative design of all circuit elements, and self-limiting protection against brief overloads should result in a long, trouble-free life in normal industrial service.

Polarity: Choise of positive or negative ground, by means of internal (readily accessible) jumper connections.

GENERAL DESCRIPTION

The H-line high-voltage DC power supplies are designed for industrial applications where reliability and long life are important. Adequate ventilation and correct placement of hot spots and high-voltage components, conservative design of all circuit elements, and self-limiting protection against brief overloads should result in a long, trouble-free life in normal industrial service. Low corona levels are insured by proper spacing of components, and by the use of oil insulation above 30KV. RF interference in the power lines is effectively suppressed.

All H-line power supplies are built in two parts: a control section and a high voltage section. The control cabinet is a deluxe relay rack for standard 19" wide panels, and is identical for all models. The high voltage housing is different for each model, depending on the voltage and current ratings of the supply. For low-power units below 50 KV rating, the high-voltage components are built on a steel shelf which is mounted in the control cabinet. These units are completely contained on the panel, so that they can be removed from the cabinet supplied and rack-mounted elsewhere.

For the high-power air-insulated models, a matching cabinet is supplied, containing the high-voltage components. The control cabinet is bolted onto the top of the high-voltage section, as a standard assembly. If desired, the two sections can be separated, enabling the controls to be mounted at a location remote from the high-voltage cabinet.

The high-voltage section for 50 KV-and-over models is housed in an oil-filled tank. This tank has been designed to provide easy servicing. An angle-iron frame is attached to the tank cover, and is used to mount the high-voltage components. When the cover is unbolted from the tank and lifted, the entire high-voltage section is removed from the oil. Port holes are provided in the cover for quick replacement of tubes, and for reversing polarity. Eyebolts in the cover allow for easy handling of the entire tank, or the frame alone. The cover is well-gasketed, enabling the unit to be moved without danger of spilling oil. A 10-foot interconnecting cable has been provided for remote operation of the high-voltage unit.

Meters: Two rectangular 4-1/2" meters are provided on the control panel. The kilovoltmeter has three ranges: 25%, 50%, and 100% of rated output voltage. The milliameter has ranges of 10%, 40% and 100% of rated output current. These meters are hand-calibrated to ±2% at the factory, and can be re-calibrated at any time by screwdriver-adjustable potentiometers which are part of the meter circuit.

Both meters are fully protected against overload on each range, and also when switching between ranges, by zero gaps. The kilovoltmeter reads the output voltage through

a multiplier resistor connected directly to the high voltage output terminal, to assure a load voltage reading unaffected by internal regulation. The load current is measured in the ground return of the high voltage circuits. The kilovoltmeter current drain does not affect the milliammeter reading since the kilovoltmeter ground return is connected beyond the milliammeter in the ground return circuit.

Polarity: A pair of bus bar jumpers in the high voltage section permit reversing the polarity of the output voltage as desired.

Protective Devices: Over-voltage and over-current protective devices are provided which automatically open the primary circuit when the output voltage or current exceeds the preset cut-value. The high-voltage is immediately shut off and an appropriately identified warning lamp on the front panel is illuminated. A reset button on the panel permits restoration of the circuits to pre-operation condition after correction of the fault.

Self-Holding Primary Contactor: This device is push-button controlled, and serves to prevent the supply from automatically re-energizing after a line failure, blown fuse, overload, etc., has been corrected. When its holding circuit is interrupted, the contactor opens and will remain open until the HIGH VOLTAGE START button is pressed.

Set to "O" Interlock: This device prevents energizing the equipment unless the voltage control knob is first turned back to zero, precluding the possibility of sudden application of high potentials. Each time the unit is energized, the output voltage will be initially zero, and must be raised to the desired potential by rotating the voltage control knob.

Output Shorting Switch: Whenever the power supply is shut off, a heavy-duty gravity-operated switch immediately short circuits the output capacitors, removing the possibility of damage or injury that might result from accidental contact with output terminals or load circuit.

The schematic diagram for the power supply will be found on a fold-out page at the rear of this manual. The circuit descriptions below refer to this diagram.

The heart of the power supply is the high-voltage circuitry in the central portion of the schematic diagram. All H-line units except the H-15 and H-16 utilize the full wave voltage-doubler rectifier circuit, which includes a plate transformer T2, two rectifier tubes V1 and V2, and filter capacitors C4 and C5. Models H-15 and H-16 use a full wave bridge rectifier circuit consisting of a plate transformer T2, four rectifying diodes V1a, V1b, V2a, and V2b, and a single filter capacitor C4.

When the equipment is fully operative, 115 volt, 60-cycle power is applied to the primary of variable autotransformer T1. The adjustable output voltage is applied to the primary of plate transformer T2, which steps up this voltage to a high value and applied it to the rectifier tubes. The pulsating dc output of the rectifier stage is filtered by the capacitor(s) and applied through resistor R11 and the output terminal to the external load. The series resistor R11 limits the load current to a safe value in the event of

The remaining circuit elements shown on the diagram are employed to control, monitor and safeguard the above high-voltage circuitry, as explained in the following paragraphs.

1. Application of Primary Power

Closing the LINE POWER switch S1 energizes the filaments of the rectifier tubes, and connects power to the interlock circuits. With the cabinet door interlocks S5A and S5B properly closed, and the external safety interlock circuit (connected to J4) closed, control power is connected through the normally-closed, HIGH VOLTAGE STOP-RESET push-button S2, the METER POLARITY SELECTOR switch S6, and the normally-closed contacts of the over-voltage and

(green) indicator lamp I5.

2. Contactor and SET TO "0" INTERLOCK Circuits

Microswitch S4 is ganged with HIGH VOLTAGE CONTROL T1, and is closed when the control knob of T1 is turned to its extreme counter-clockwise (zero) position. If the HIGH VOLTAGE START push-button S3 is pressed when T1 is not at zero, the SET TO "0" INTERLOCK OPEN indicator lamp I4 will light. With T1 at zero, however, S4 is

closed, and the power contactor K1 is energized when S3 is pressed. The holding contact of contactor K1 bypasses both S1 and S4, so that K1 remains energized after the push-button is released and the T1 control knob has been rotated away from zero position. The main contacts of K1 connect line power to the primary of autotransformer T1, and energizes the HIGH VOLTAGE ON (red) indicator lamp I6, while the opening of the normally-closed contact energizes the HIGH VOLTAGE READY indicator I5. The adjustable output of autotransformer T1 is applied to the primary of high-voltage transformer T2. Rotation of the T1 control knob on the front panel causes the high-voltage output to vary smoothly and continuously between zero and the rated maximum voltage.

When the HIGH VOLTAGE START push-button is pressed, the OUTPUT CURRENT meter M2 and the over-current relay K5 are temporarily disconnected from the load circuit, to avoid damage or shut-down due to charging currents.

3. Output Shorting Switch

Pressing the HIGH VOLTAGE START button also energizes relay K6, which is then held by the same holding circuit as is the main contactor K1. In the de-energized position, K6 short-circuits the high-voltage output terminals or load circuits during shut-down periods. When K6 is energized, this short circuit is removed, but since the relay armature return is gravity-operated, it stands ready to reapply the short circuit immediately upon malfunction or failure of the supply. Resistor R13 limits the short-circuit capacitor discharge current to a non-destructive value.

4. Over-Voltage Circuit

Relay K3 is connected in series with multiplier resistor R12 and OUTPUT VOLTAGE meter M1 across the high voltage output. By mechanical adjustment this relay can be made to close its contacts when the output voltage of the supply exceeds the rated maximum by any chosen amount up to 25%. When K3 closes its contacts, the coil of relay K2 is energized. Examination of the relay circuits will show that this causes the OVER-VOLTAGE (amber) indicator lamp I7 to light, holds the coil of K2 in energized condition, and shuts down the high voltage by de-energizing K1 and K6. To restore the equipment to operation, it is then necessary to rotate the voltage control knob back to zero, press the HIGH VOLTAGE STOP-RESET button, and then press the HIGH VOLTAGE START push-button S3.

Over-Current Circuits

Relay K4 is actuated by closure of the contacts of relay K5, which is energized when the load current exceeds a set value. This value can be adjusted between 35% and 150% of the rated maximum output current by means of rheostat SR9, and R14. A two-position switch S9 on the front panel permits selection of two preset values of current trip-out by connecting the appropriate rheostat into the circuit.

When K4 is energized it lights the OVERCURRENT (amber) indicator lamp I8, establishes a hold circuit for its own coil and shuts down the high voltage circuits. After removing the cause of the excessive current drain, the equipment can be restored to operation as outlined for the over-voltage circuit above.

6. Metering Circuits

The voltmeter is connected in series with multiplier resistors R12 and R2 direct to the high voltage output terminal, to permit monitoring the load voltage without introducing [illegible] due to regulation of the power supply. The voltmeter is returned to a point beyond the ammeter on the ground return, so that the current drawn by the voltmeter will not be registered on the ammeter.

The ammeter is connected in series with the ground return of the external load, and reads output load current, rather than total supply current.

Each meter is equipped with individual shunt potentiometers for each of the three meter ranges, to permit recalibration of the meters at regular periods.

7. Polarity Control

On the same chassis as the high-voltage rectifier tubes are a pair of bus-bar jumpers equipped with banana plugs (P7, P8, P9 and P10) on the schematic diagram . The mating jacks for these plugs are so arranged that the bus-bars can be removed, rotated 90 degrees, and reinserted to provide a reversal in output polarity. METER POLARITY SELECTOR switch, S6, on the front panel is then thrown to the appropriate position, so that the meters still read upscale for an increase in current or voltage. To avoid damage to the meters in case the switch is inadvertently thrown during normal operation, an auxiliary break-before-make contact on the switch momentarily interrupts the interlock chain, causing the supply to be shut down immediately when the switch is rotated.

[illegible] resistance, and bypasses any additional currents which might [illegible] damage the protected components.

1. Remove the shorting wires from the meter terminals.

2. Install the NE-34 neon glow lamps in the receptacles on the control panel.

3. FOR AIR-INSULATED UNITS

   a. Cut the cords used to secure the plate leads for shipment.
   b. Cut the cords used to secure the solenoid plunger.
   c. Install the rectifiers in their sockets, and close the tube clamps (clamps not supplied for screw-in and twist-in rectifiers).
   d. Connect the plate leads to the plate caps of the rectifier tubes.

4. FOR OIL-INSULATED UNITS

   a. Lift the frame and cover out of the tank and put the unit over [illegible] edge of the tank as directed in the separate instruction.
   b. Cut the cords used to secure the plate leads for shipment.
   c. Cut the cords used to secure the solenoid plunger.
   d. Install the rectifiers in their sockets.
   e. Connect the plate leads to the plate caps of the rectifier tubes.
   f. The tank is provided with fittings for valves, and these may be installed if desired. If not, oil may be poured in directly through the top, and pumped, syphoned, or bailed out when required.
   g. Fill the tank to the oil level line on the inside of the tank (about 2-1/2" from the top) with high grade transformer oil of at least 25KV test rating. When pouring the oil in through the top, avoid splashing as much as possible, since this causes aeration of the oil. When pumping, the oil should enter at the lower valve fitting.
   h. Install the output cable in the jack on the frame and screw the clamp fitting down on the cover.
   i. Lower the frame and cover into the tank slowly to avoid splashing.
   j. Bolt the lid down, using a hand wrench to tighten the bolts.
   k. Screw the interconnecting cable in place at both the solenoid chassis and tank ends.

5. Make certain that the control-to-high voltage interconnection cable is tight.

6. Wire the Cycle-Z unit in series with an external safety switch. This switch should be closed in the arc-operating position. If no safety switch is desired, a jumper across the terminals of the plug.

7. Check that the door interlock plug is properly seated.

8. Wire the three-prong Hubbell plug to a source of 117-volt, 60-cycle, [illegible] should be connected to the power source.

9. BE SURE TO GROUND THE EQUIPMENT TO A GOOD EXTERNAL GROUND. Use at least 12 gauge wire.

10. a. Set the output voltage polarity jumpers as desired. Refer to the PARTS PLACEMENT HIGH VOLTAGE SECTION dwg. aH-3 for proper orientation of the + and - bus bars.

    b. Set the front panel METER POLARITY SELECTOR switch accordingly.

11. Set the OVER CURRENT TRIP ADJUST on the front panel to the desired tripping [illegible] refering to the [illegible] Curve dwg. aH-4. This graph is presented in terms of percentage of maximum rated supply current.

12. Overvoltage adjustment is made directly on the relay K3. Increase the torsion of the helical spring for higher voltage trip-outs; reduce the torsion for lower voltage trip-out. Use a small open-end lug [illegible] turns then check to see if desired tripping voltage has been attained. When checking for trip voltage, it is necessary to turn the OUTPUT VOLTAGE CONTROL very slowly, since surges will produce an erroneous trip point. DO NOT ADJUST THE CONTACT POINTS ON THE RELAY.

Note: The following procedure outline assumes that the overvoltage and overcurrent relays have been adjusted for trip-out at the proper values, and that the output voltage polarity is correct. If these require readjustment, refer to Installation Instructions, paragraphs 10 - 12, above.

1. Connect the output cable to the load.
2. Rotate the high voltage control knob to zero position.
3. Place the LINE POWER switch in the ON position. The green AC POWER ON and CONTACTOR CLOSED indicators should light if the interlock circuits are properly closed and the control fuse is not blown. These can be checked by observing front panel indicators. Check at the power line, and the HIGH VOLTAGE STOP pushbutton if the READY indicator fails to light.
4. Press and release the HIGH VOLTAGE START pushbutton. The red HIGH VOLTAGE ON indicator should light.
5. Set the METER RANGE SELECTOR switches ST and IM to the ranges appropriate to the intended output voltage and current.
6. Adjust the high voltage control knob to provide the desired output conditions.
7. TO SHUT DOWN THE HIGH VOLTAGE CIRCUITS: first turn the HIGH VOLTAGE CONTROL to zero. Then press and release the HIGH VOLTAGE STOP pushbutton. The HIGH VOLTAGE ON indicator should be extinguished, and the HIGH VOLTAGE READY indicator should light. This shut-down procedure should be followed during normal operation. In an emergency, however, the HIGH VOLTAGE STOP pushbutton should be pressed without hesitation. It is desirable to lower the voltage gradually when possible to avoid discharge surges in the shorting mechanism.
8. To shut down the entire equipment, place the line power switch in the OFF position.
9. OVER-VOLTAGE OR OVER-CURRENT CORRECTION: If an overload during operation, the HIGH VOLTAGE ON indicator is extinguished and the OVERVOLTAGE OR OVERCURRENT lamp lights, turn the voltage control knob to its zero position, then press and release the HIGH VOLTAGE STOP-RESET pushbutton. THE HIGH VOLTAGE READY indicator will then light. Press and release the HIGH VOLTAGE START pushbutton. If proper operating conditions have been re-established, the HIGH VOLTAGE ON indicator will light and the HIGH VOLTAGE READY indicator will be extinguished.

BASIC PARTS LIST

H-LINE POWER SUPPLIES

PART #	SPECIFICATIONS
A1	Rack panel; 19-1/4" wide x 3½" deep x 35¼" high (for standard 17½" panel; MJE finish; Premier-DSR16179 or equiv.
A2	Panel; 19" wide x 17½" high; standard WE aerospace; Steel; MJE finish; Premier RP1719.
A3	U-bracket as per dwg D-HV9
A4*	High Voltage Section housing
C1,2	0.01 mfd-400 volt, C. D.-PJ4S1, or equiv.
C3*	Capacitor
C4,5*	Capacitor
F1	Extractor post cartridge fuse, quick acting type; 250 volt AC; 3 amp.; Littlefuse 340 or equiv.
F2*	As F1; rating on auxiliary parts list.
I1,2	Neon glow lamp built into fuseholder XF1,2
I3,4	Neon glow lamp, 65 volt maintaining, 1/25 watt, miniature bayonet base; 2851, T-3 1/4 bulb
I5,6,7,8	Incandescent pilot lamp, 115 volt, 6 watt, Candelabra base; #686
I9,10	Neon glow lamp, 65 volt maintaining; 1 Watt; double contact bayonet candelabra base; NE 32, T-10 bulb
I11	Same as I3,4
J1	3 pole recessed male power receptacle; 125 volt, 15 amp.; 250 volt, 10 amp.; Mabuell Twistlock 7554
J2	Standard flush female receptacle; 115 volt, 15 amps.; 250 volt, 10 amp.; Amphenol 61F1
J3,4	2 contact receptacle, Cinch-Jones S302FP
J5	9 Contact receptacle; AN3102-22-16S
J6*	AN connector
J7,8,9,10	Reversing Jacks, Birnback #403
J11*	Jack
K1	Relay; 115 volts AC coil; DPDT, 15 ampere 115 volt AC contacts with auxiliary holding contact; Potter-Brumfield PR1766

See auxiliary Parts List (Sheet 4)

K1 — Relay; 115 volt, AC coil; 3PST, 3 amperes, 115 volt AC contact; Potter-Brumfield MR5

K2 — 1/2 attitude DC, 5000 ohm coil, 3PDT, 3 amperes, 115 volt AC contact; Sigma type 5F 8000SS

K3 — Same as K2

K4 — Same as K3

K5 — Solenoid; 115 volt AC coil, 2" throw; [illegible]

M1,2* — 100 microamp DC full scale; 2" rect. [illegible] (Simpson model 79 or equiv.) for list level see auxiliary parts list.

P1 — 4 pole female power connector; 125 volt, 15 ampere; 250 volt, 10 ampere; Bulgin Catalog [illegible]

P2 — Not used

P3,4 — 2 contact plug; Cinch-Jones P302-CCT

P5 — 5 contact plug; [illegible] with clamp AN3057-2

P6 — AN connector

P7,8,9,10 — Reversing plugs, Birnbach #401

P11 — Plug

R1,2 — 1500 ohm, 1 watt, [illegible] screw, 25 terminal [illegible] type DCF or equiv.

R3,4-[illegible],5 — 3 Meg., 2 watt, [illegible] composition potentiometer, [illegible] tapered; linear taper; screwdriver slot, insulated type shaft; Allen Bradley CIU-2352

R6 — 0.5 Meg. As above; Allen-Bradley CIU-5041

R7 — 0.25 Meg. as above; Allen Bradley CIU-1041

R8 — 50 K, 2 Watt, W.W. [illegible]meter; standard shaft; linear Clarostat 4301-50K

R10,11,12, 13* — Resistor

S1* — Manual starter, with thermal overload protection; 3 pole, 230 volt AC rating; open type; Square D-[illegible] for overload unit, see auxiliary parts list.

S2 — Momentary [illegible] action; 2 circuits, 1 normally open, 1 normally closed; toggle [illegible]; 10 amperes, 600 volts AC [illegible]; GE, Square D, 9001-[illegible]

S3 — As above, Black, Square D-9001-G01

S4 — Spring Lever Return; single pole, double throw, 15 amps. 115 volt AC rating; [illegible] type or [illegible]

S5a,b — Door interlock switch, [illegible] mounted; 15 amp., 115 volt AC rating; GE 7460330 G4

S6 — Rotary selector switch, 6 pole, 2 position, non-shorting; steatite insulation; Centralab 2537

[illegible]	Rotary selector switch; 1 pole, 3 position, shorting; steatite insulation; Centralab PA 2000
T1*	Single phase, manual control Superior Electric Company Powerstat; for ratings and model, see auxiliary parts list
T2*	Plate Transformer
T3*	Filament Transformer
V1,2*	High voltage rectifiers
W3*	Output cable
W2*	Multi-conductor cable
XF1,2	Fuse holder, with built-in neon, Buss type HKL-X
X1,2	See XF1,2
X3,4	pilot light holder with built-in resistor; for T-3¼ bulb; clear faced lens: Dialco type 811305-437 or equiv.
X15	Pilot light holder for S6 lamp; Green Jewel Dialco 51901-43 or equiv.
X16	As above, red jewel
X17	As above, amber jewel
X18	As above, amber jewel
X19,20	[illegible]
X111	Pilot light holder for T-3-¼ lamp; Dialco 4931-12
XV1,2*	Tube sockets
E1,2*	V1,2 plate Caps
E3,4*	XV1,2 Anti-corona shield
E5-10*	Spark protectors
E11*	Output cable
C1-4*	Casters

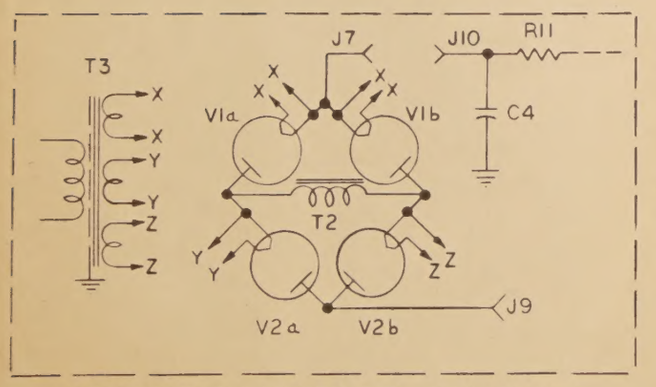
* See auxiliary parts list (Sheet 4)

AUXILIARY PARTS LIST
H-45 (20KV-50MA)

A4	High voltage section housing; 22" wide x 18" deep x 28" high; 19" x 26-1/4" panel space; NJE #101/C7-A518
A5	19" x 26-1/4" panel, #12 guage steel, NJE finish
C3	Electrolytic capacitor, 25 mfd - 150v; Cornell Dubilier #BR2515
C4, 5	Oilfilled dual capacitor, 0.25 - 0.25 mfd at 20KV total; Plastic Capacitor #OE200-124C
E1, 2	Pulse plate caps, National #SPP-3
E3, 4	Not used
E5, 10	Flashover protectors; Brach type MCDT-4
E11	Strain relief bushing; Heyman Mfg. Co. #SR7P
F2	15 amperes, Littelfuse 3AG
J6	9 contact receptacle; AN3102-22-16P
J11	Not used
M1	Scale reads 0 - 5/10/20 Kilovolts DC
M2	Scale reads 0 - 5/20/50 Milliamperes DC
O1-4	Not used
P6	9 contact plug; AN3106-22-16S with clamp AN3057-12
P11	Not used
R3	10 Kilohm - 2w, wirewound potentiometer; ±5% tolerance, linear taper; screw driver slot, locking type shaft; Clarostat #43C2-10K
R4	2.5 kilohm - 3w, per above; Clarostat #58C2 - 2500
R5	1.0 kilohm - 25w per above; Ohmite Series A, Model H, #0153
R10	0.5 kilohm - 10w, adjustable resistor, wirewound; Ohmite #1019
R11	10 kilohm - 50w, wirewound resistor; Ohmite #0414
R12 a, b	80 megohm - 6w, high voltage resistors; R.P.C. type DFF (2 in parallel used)
R13	100 kilohm - 50w, wirewound resistor; Ohmite #0422
S1	Heater element, 16 amperes; Square D-W16.7
T1	115/0-135V at 20 amps. powerstat; Superior type 136
T2	Primary: tapped, 95/105/115/125v at 60 cycles; Secondary: 2 x 5.5 kv, rms at 125 MA RMS (parallel connected), Start of secondary insulated for 17.5 KV DC; NJE #T-HP20D50
T3	Primary: 115v at 60 cycles; Secondary: 2 x 5v at 6 amps each, 30 KVDC insulation; NJE #T-HF30D5

V1, 2	100 MA average current, 5KV peak inverse voltage, 5v at 6 amps filament; RCA type 8020
W1	10 feet of RG8/U coaxial cable
W2	3 feet of multiconductor cable #16 stranded - neoprene covered.
XV1, 2	4 pin medium bayonet socket; Johnson #123-210-1

115 VAC INPUT
TO EXTERNAL GRD
LVR
P1
OPTIONAL EQUIPMENT
115 VAC INPUT
J1
J2
TO EXTERNAL GRD
115 VAC OUTLET
S1 LINE POWER
PROVISION FOR SOLID NEUTRAL
CONTROL FUSE
F1
DOOR INTERLOCKS IN CONTROL AND/OR HIGH VOLTAGE SECTION
I3 INTERLOCK OPEN
J3 "DOOR INTERLOCK"
J4 "SAFETY INTERLOCK"
P3
S5A S5B
S2 RESET HIGH VOLTAGE STOP (OVERVOLTAGE OR OVERCURRENT)
S6 METER POLARITY SELECTOR
(AMBER) OVERVOLTAGE
I7
K2
K4
I8
(AMBER) OVERCURRENT
K1
I5 (GREEN) HIGH VOLTAGE READY
S4 (INTERLOCKED WITH HIGH VOLTAGE CONTROL)
I4
SET TO "0" INTERLOCK OPEN
S3
HIGH VOLTAGE START
OVERCURRENT TRIP ADJUST
R10
R9
C3
I9
S6 METER POLARITY SELECTOR
K5
T3
E5
E6
E9
J8
J9
P8 P9
P7 P10
J7
J10
POLARITY REVERSING BARS
V1
V2
T2
C4
C5
R11
R12
R13
K6
E10
J11
P11
W1
E11
HIGH VOLTAGE OUTPUT
I10
S7 METER RANGE SELECTOR
LOW
MED
HIGH
R3
R4
R5
MA
OUTPUT CURRENT M2
R1
E7
E8
I11
K3
S8 METER RANGE SELECTOR
S6
M1 OUTPUT VOLTAGE
KV
R2
R6
R7
R8
(RED) HIGH VOLTAGE ON
I6
T1
C1
C2
PRIMARY FUSE
F2
I2
HIGH VOLTAGE CONTROL
PROVISION FOR SOLID NEUTRAL



HIGH VOLTAGE CIRCUIT-MODEL HI5 & HI6 ONLY

NOTES:
1. E5-E10 NOT USED IN SINGLE CABINET MODELS.
2. J11 & P11 USED IN OIL INSULATED MODELS ONLY.

DESIGNER	N.J.E. CORPORATION
DRAWN BY	345 CARNEGIE AVE. KENILWORTH, N.J.
DATE 3-13-58	H-LINE SCHEMATIC DIAGRAM
APPROVED BY	
CHECKER	DWG. NO. H1 ISSUE O
	SHEET OF SHEETS

OUR WARRANTY: N J E Corp. warrants each power supply manufactured by them to be free from defects in material and workmanship. Our liability under this warranty is limited to servicing or adjusting any instrument returned to the factory for that purpose and to replacing any defective parts thereof, except tubes and fuses in "standard-grade" models. This warranty is effective for one year after delivery to the original purchaser when the instrument is returned, transportation charges prepaid by the original purchaser, and which upon our examination is disclosed to our satisfaction to be defective. If the fault has been caused by misuse or abnormal conditions of operation, repairs will be billed at cost. In this case, an estimate will be submitted before the work is started.

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